

# NAVAIR Progress in Assessing, Validating and Implementing Non-Chromate Primers

February 9, 2011

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE <b>09 FEB 2011</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2011 to 00-00-2011</b>	
4. TITLE AND SUBTITLE <b>NAVAIR Progress in Assessing, Validating and Implementing Non-Chromate Primers</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Naval Air Warfare Center, Materials Engineering Division, 22347 Cedar Point Road, Patuxent River, MD, 20670</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>ASETSDefense 2011: Sustainable Surface Engineering for Aerospace and Defense Workshop, February 7 - 10, 2011, New Orleans, LA. Sponsored by SERDP/ESTCP.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>19</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# Overview

- Why?
- Application Areas: Status
- On-going efforts
- Implementation Strategy
- Comprehensive NC Primer Projects
- Where are we going?



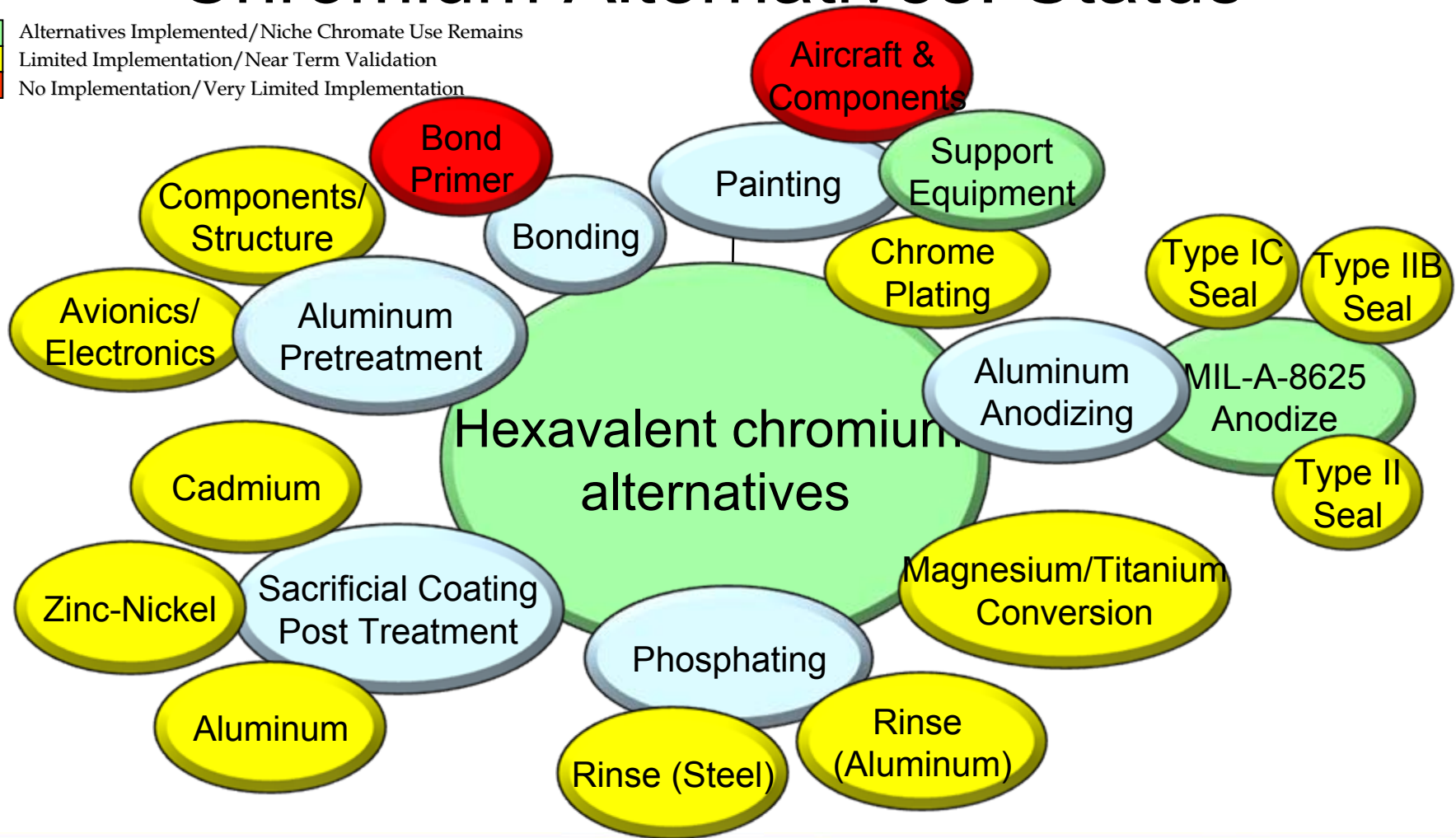
# Why?

To understand the balance between corrosion protection, environmental benefits, regulatory compliance and logistics for any new coating or coating system



# NAVAIR Application Areas for Hexavalent Chromium Alternatives: Status

- Alternatives Implemented/Niche Chromate Use Remains
- Limited Implementation/Near Term Validation
- No Implementation/Very Limited Implementation



# On-going Efforts

Project/Primer	Goal
Mg-Rich Primer	Optimize primer for general use
Electrocoat Primer	Optimize, demonstrate and validate primer/process for aluminum component rework/repair
Non-Chromate, Zero VOC Coating System	Demonstrate and validate coating system for steel ground support equipment
Crosslink	Optimize and mature primer formulation for general use



# Mg-Rich Primer

- Assessing MgRP003 formulation in testing:
  - P003 performs better than 1<sup>st</sup> and 2<sup>nd</sup> generation formulations (MgRP XP406/XP417)
- Modifications have greatly improved performance
- For use in Naval environment, self-corrosion failure mechanism in accelerated (NSS/SO<sub>2</sub>) and beach environment must be understood and overcome
- NAVAIR pursuing cooperative research and development agreement (CRADA) with AkzoNobel to further improve performance to meet NAVAIR requirements



Early Akzo Nobel  
formulation after  
1056 hrs SO<sub>2</sub>

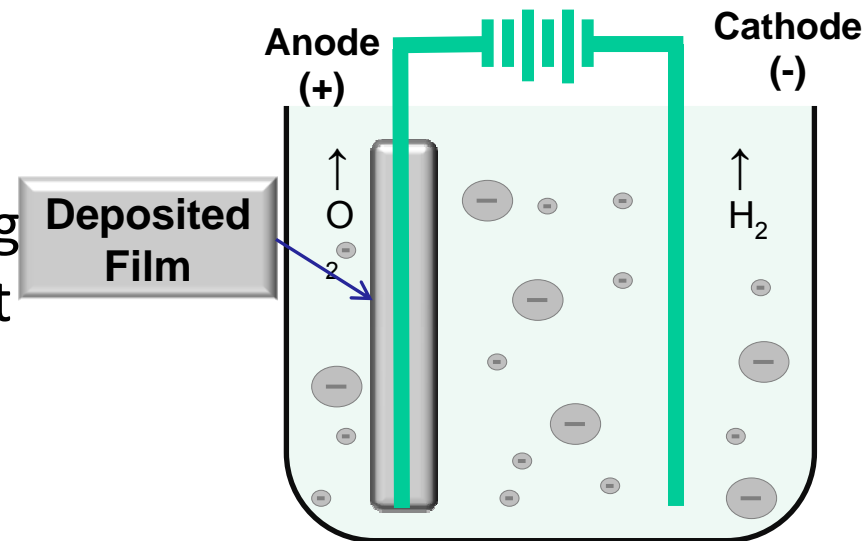


Latest version  
from Akzo Nobel  
after 1176 hrs  
SO<sub>2</sub>



# Electrocoat Primer

- Primer formula optimization in progress – NSS,  $\text{SO}_2$ , Galvanic assembly, Beach Exposure Testing
- Dem/Val location: FRC-Southwest (NAS NI)
  - Electrocoat tank installation
  - Demonstrate primer on aluminum components, such as wheel assemblies





# Non-Chromate, Zero VOC Coating System

- Current coating process for steel: grit blast & paint direct to metal
- NC/ZVOC coating system to be demonstrated at FRC-East on Navy ground support equipment
- Laboratory Testing Complete – Humidity, RSL and WTA performed at NAS PAX, GM9540P & Pull-off Adhesion performed at ARL, Beach Exposure testing conducted at Cape Canaveral by Army.

**Topcoated w/ Deft 55W002  
(85285, Ty III)**

**Primed w/ Deft 02GN084  
(23377N, Ty I)**

**Chemetall Oxsilan  
(NC Pretreatment)**

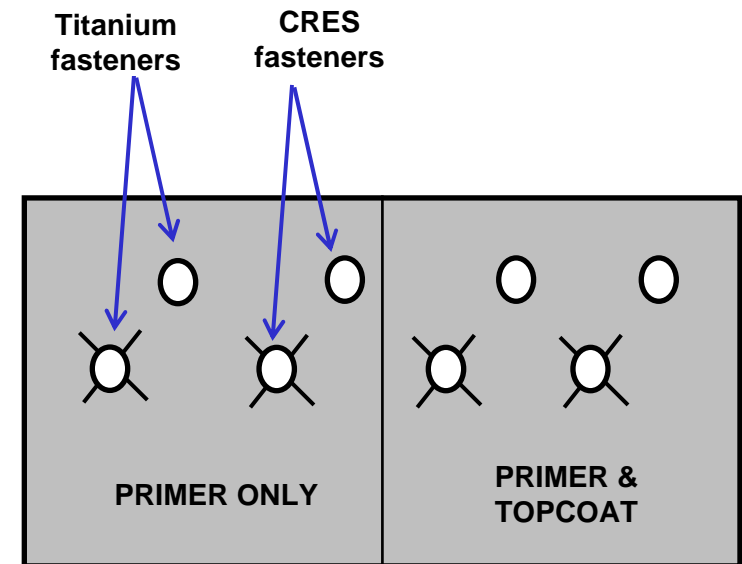
**STEEL**

# Crosslink Primer

- Previously funded through ESTCP Project #WP-200904
- 3-component primer based on promising new NC pigment package
- Crosslink partnered with Hentzen Coatings, Inc. and Wayne Pigment Corporation to optimize and mature primer formulation
- In-house  $\text{NSS}/\text{SO}_2$  testing in-progress

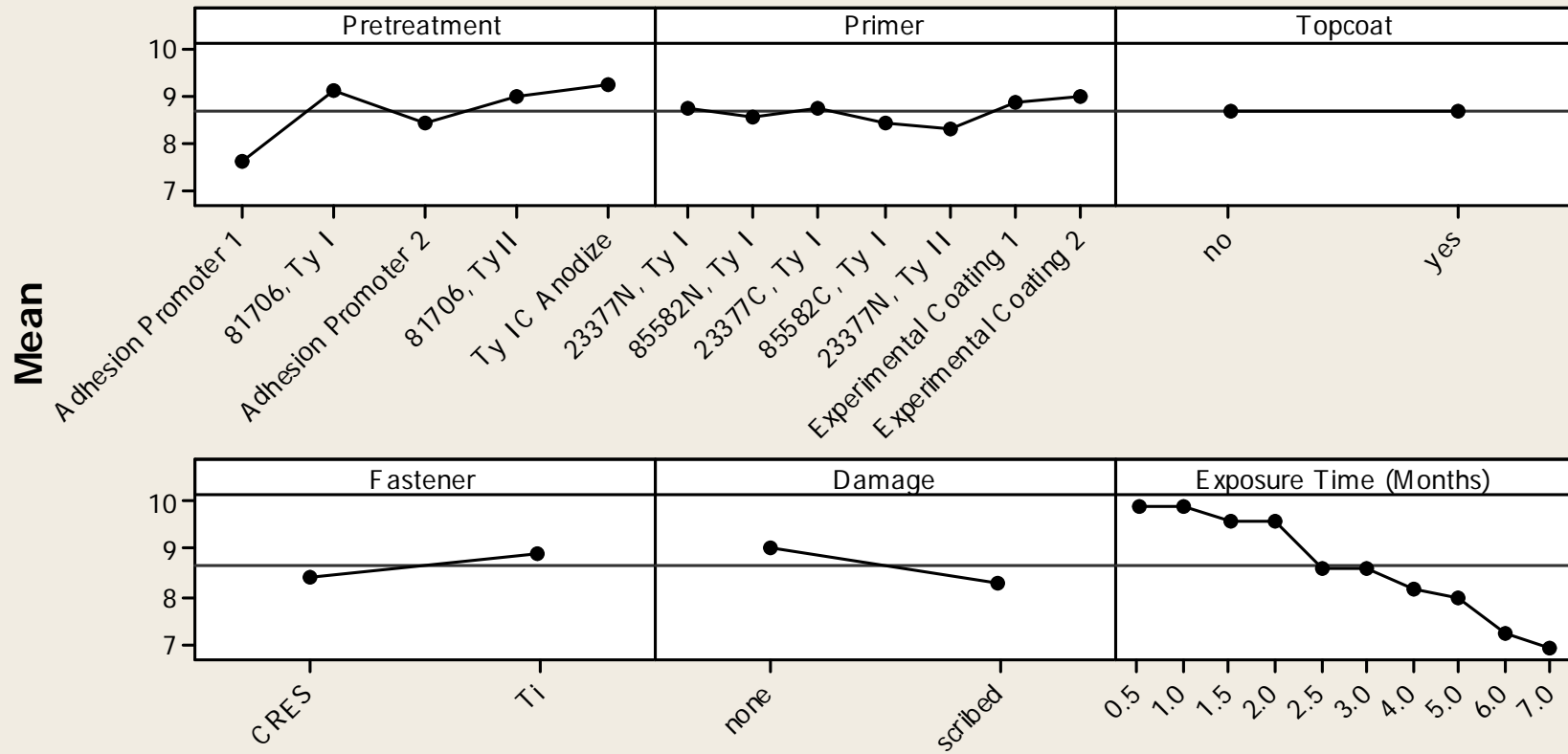
# NC Primer Comprehensive Evaluation: (In-house Study)

- Evaluated coatings systems made up of 5 different pretreatments and 7 different primers.
- Scribed flat panels and galvanic assemblies tested in NSS, SO<sub>2</sub>, and beach exposure
- Minitab - statistical analysis



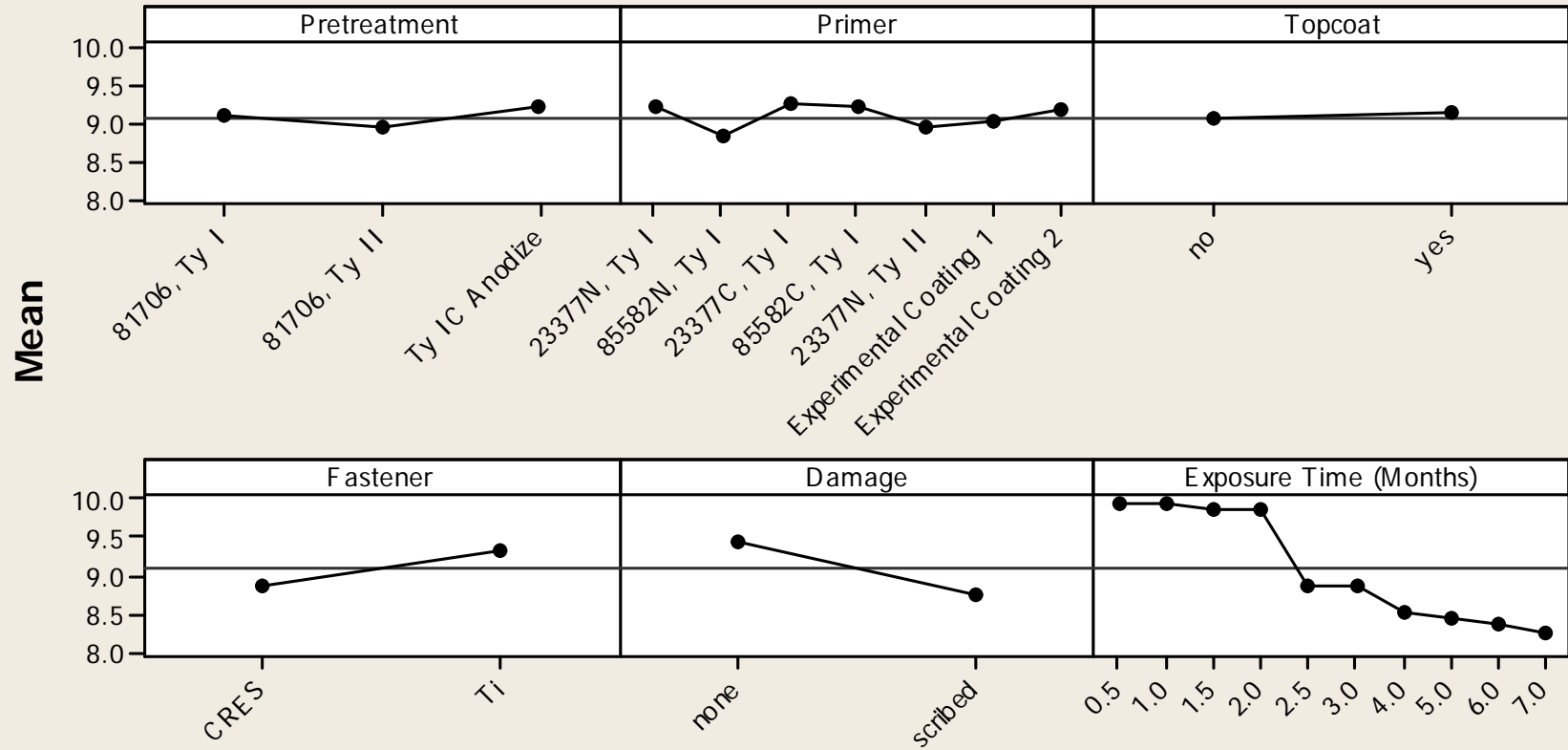
## Main Effects: All Coatings

Data Means



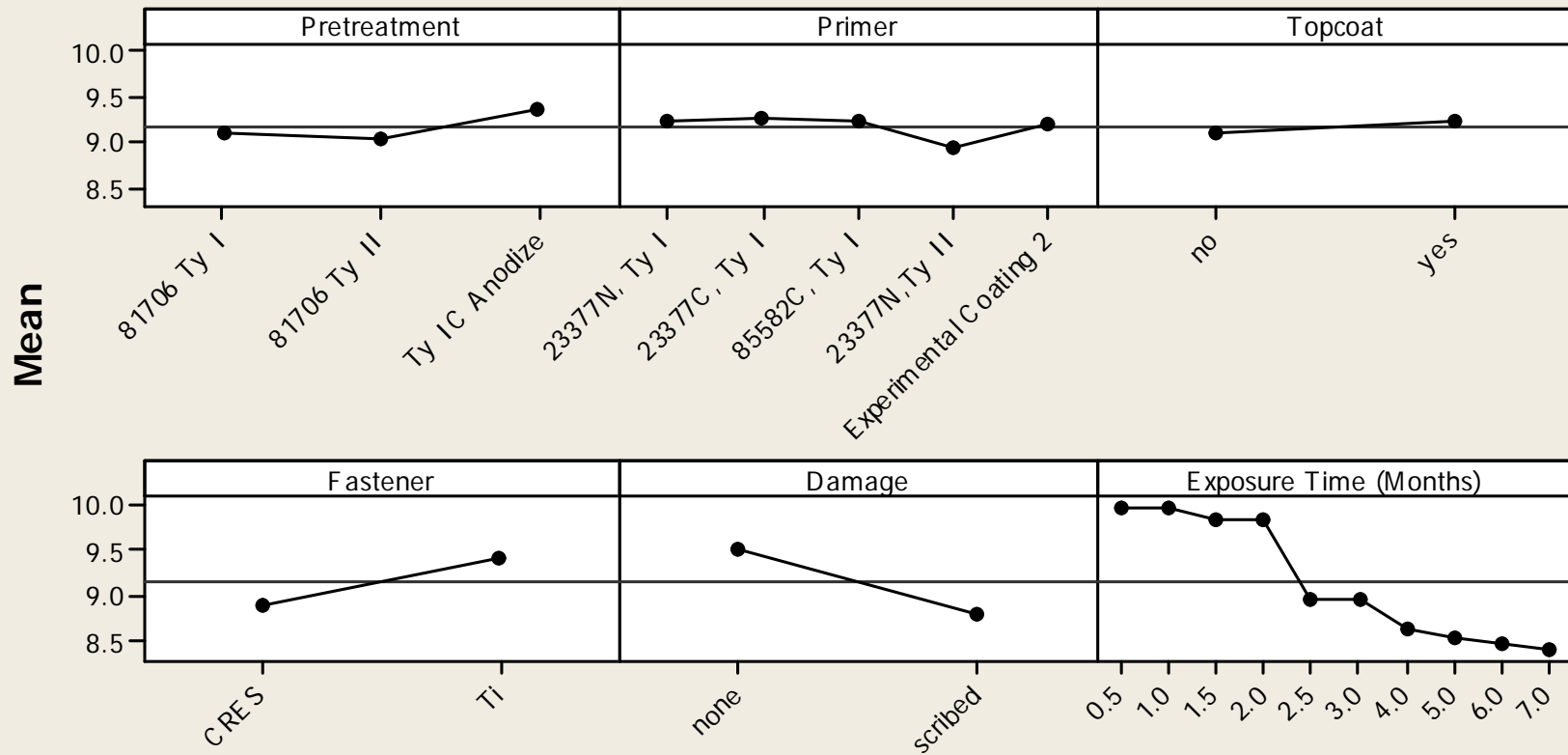
**Main Effects: Best Surface Treatments, All Primers**

Data Means



## Main Effects: Best Coatings

Data Means



# Implementation Strategy

- Based on primer risk assessment
- Application Axis vs. Platform/Basing Axis
- Application Axis: Low-to-High Risk
  - 1 (L) – Composite/Fiberglass Surfaces
  - 2 (L) – Non-critical Metallic Surfaces – External Fuel Tanks, etc.
  - 3 (M) – Airframe Tie-Coat Applications
    - 3A – OML / 3B – IML – Topcoat or inspectable areas only
  - 4 (M-H) – Airframe Direct-to-Metal Applications
    - 4A – OML / 4B – IML
  - 5 (H) – Interior/Faying Surface/HS Components.





# Implementation Strategy

- Platform Axis
  - 1 (L) – Trainer Aircraft – T-45, T-34, etc.
  - 2 (M) – Land based Aircraft – KC-135, C-40, etc.
  - 3 (M-H) – Special Land – P-8, H-53, etc.
  - 4 (H) – Ship-based Aircraft – E-2, H-60, etc.
  - 5 (H) – Ship-based Aircraft – \*Specialty Coatings
    - F/A-18, EA-18G, F-35, etc.



# Comprehensive Evaluation and Transition of NC Primers

- **GOAL:** *Evaluation & dem/val of mature non-chromate primers for corrosion/environmental performance over a range of platforms and applications, starting with lower risk implementation strategies*
- Focus on Navy-specific requirements:

FRC-East	FRC-Southeast	FRC-Southwest
<ul style="list-style-type: none"><li>• <b>V22:</b> NC primer as tie coat with Type IV topcoat</li><li>• <b>H-46:</b> Ty II conversion coating w/ mature Ty II, NC primer</li><li>• Dem/val NC primer on composite components</li></ul>	<ul style="list-style-type: none"><li>• Ty I &amp; II NC coating systems, including Ty II conversion coating and NC anodize sealing</li><li>• Dem/val NC primer on composite and avionics components</li></ul>	<ul style="list-style-type: none"><li>• <b>E-2/C-2:</b> Leading Ty I NC Primer over CCC on outer moldline; if successful, implement coating system on interior/components</li><li>• Transition E-2 coating system to <b>F/A-18 Hornets</b></li></ul>



# Comprehensive Evaluation and Transition of NC Primers

- **GOAL**

- *“Top down” assessment of current NC primer technology, including coating process MRL and coating TRL*
  - *Dem/val NC primers and processes with sufficient process and coating maturity and invest in development of promising newer technologies*
- Test multiple substrates, surface conditions, exposure environments and coating combinations, comparing to CCC
- Joint service demonstration (Army, AF, USCG, USMC)



# Where are we going?

- Use the NESDI and ESTCP efforts to address the DoD Cr<sup>6+</sup> memos and anticipated new DFARS contract language and *accelerate* the transition of NC primers at DoD and OEM/Sub-contractors.
- Efforts will provide the data required to make authorization and implementation decisions, starting with low-risk applications and moving toward medium and high-risk applications as warranted by products



# Questions?

